



HD STANDARDS CONVERSION



Need to do
this?



CI-FER



Your HD
infrastructure
is in reach

Standards converters have been around for over 30 years. But for HD, the situation is markedly different to that of the old PAL/NTSC converters. Instead of just two basic standards, HD runs to 26, and there seem to be additional standards appearing all the time.

Standards conversion relies on the process of interpolating picture content – either because you need extra pictures (going from 50 to 60Hz) or because you need less. In both cases it's necessary to create images that simply did not exist in the original picture stream.

The best way to convert is to create a completely new stream of pictures, based on the originals, but interpolated to the correct information for the required output standard. The simplest way to do this is to store several pictures and then average across them to produce a new stream. This is fine for still pictures, but would produce a blurred mess if they included movement. In fact there are many low-cost standards converters for SD that use this method – normally using four fields of storage. The results are just about acceptable if there's not too much rapid movement – but this technique is simply not adequate for HD.

Motion Compensation

What is required is a way of estimating where elements of the interpolated picture would be, based on the direction and speed of movement of those elements. The direction and speed values can be expressed as vectors, and these can be used to “move” the elements to the correct position in the new interpolated frame.

The motion estimation process is very complex, and requires considerable computing power, not to mention sophisticated algorithms, to produce a satisfactory result. But when applied correctly, the resulting pictures can hardly be distinguished from the originals.

The impact of motion compensation is immediately visible on any picture sequence involving motion. Take the example of a typical news or sports presenter situation. A fairly static picture of the presenter with a tickertape running across the bottom edge of picture. Without motion compensation you will not be able to read any of the tickertape text. With motion compensation it is virtually indistinguishable from the original.



'Conventional four-field conversion'



'Cifer – with motion compensation'

Modular Approach

There are other key issues in the HD world. Traditionally, standards converters were supplied as standalone boxes. They only had to convert video pictures and any audio was routed and processed externally. Today, it's more likely that audio signals will be embedded in the video stream, possibly along with a range of other metadata. Therefore a modular HD standards converter, where different modules can be added around the basic video converter to support different demands, provides new levels of flexibility.

In its basic form Cifer consists of 2 modules fitted in a standard **V1606** rackframe from Pro-Bel's Vistek range. Cifer's rear module, however, occupies 5 module slots. Four slots are for the Converter and Motion Estimator Modules each with an associated fan module for cooling purposes. The remaining slot is for the optional inclusion of a **V6302/AH** advanced audio processor. This communicates with Cifer via the extended rear module. With the **/AH** audio mux/demux sub-module option fitted, embedded AES audio streams can be extracted, processed, delayed and reformatted for inclusion in the serial digital output. Whilst this configuration can fulfil the bulk of both video and audio processing requirements there are still 9 remaining slots in the frame for other interfaces. For example, composite analogue video interfaces can be implemented by inclusion of the **V1667** and **V1668** high performance multistandard PAL/NTSC converter modules.

Associated modules are available to handle the complexity of Dolby E.

The **V6302/DB/AH** is an enhanced version of the V6302/AH that includes a Dolby Digital/Dolby E decoder sub-module. Re-encoding on the output of Cifer can be implemented with a **V6304** Dolby E Encoder Module.

CIFER



Cifer

Cifer is the world's first modular Motion Compensated HDTV Standards Converter. It is the result of a collaborative development between Pro-Bel and Digital Vision of Sweden to produce a universal device offering the highest performance levels in terms of picture quality, flexibility and ease of use. Combining Pro-Bel's proprietary advanced algorithms for HD (and SD) format conversion with Digital Vision's patented and Emmy™ award-winning motion estimation technology ensures near total transparency and preservation of the original picture.

System Standards

Cifer can be configured to provide any major HD or SD output format and frame rate irrespective of the input format or frame rate. It automatically detects the input signal standard and converts it to the selected output signal standard. The insertion delay is fixed to 200ms for all conversions. The output signal can be genlocked using a 'black and burst' or tri level reference signal.

CIFER Conversion Table

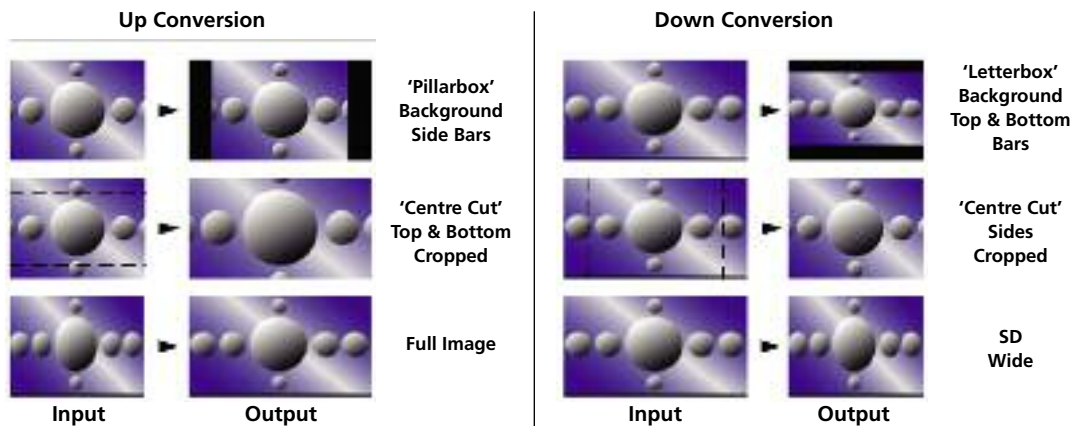
		OUTPUT										
		HD-SDI						SD-SDI				
		1080i		60		720p		50		59.94		
INPUT	HD-SDI	50	↔	→	→	→	→	→	SD-SDI	576i	↓	↓
		59.94	→	↔	→	→	→	480i		↓	↓	
		60	→	→	↔	→	→	↓		↓		
		720p	→	→	→	↔	→	↓		↓		
		50	→	→	→	↔	→	↓		↓		
		59.94	→	→	→	→	↔	↓		↓		
	SD-SDI	576i	↑	↑	↑	↑	↑	↔	↔			
		480i	↑	↑	↑	↑	↑	→	↔			

It is envisaged that other system standards encompassing alternative frame rates (e.g. 23.98psf) will be available in due course.

Key	Cross	Up	Down	Bypass
Same Frame/sec	↔	↑	↓	↔
Different Frame/sec	→	↑	↓	NA

Picture Aspects

All the major broadcast picture aspects are supported including standard definition wide-screen (SD Wide) normally only encountered in the 576i format.



Features

- HD/SD format & Frame Rate Conversion
- Vector motion compensation
- High performance Motion Estimator
- 2 x 1 HD (SD) input switch
- Auto locking to all major HD/SD standards
- 2 SDI outputs
- Auto bypass maintains output timing regardless of input type

- Choice of output picture aspect ratio
- Colour Space Conversion
- Noise Reduction
- Video Processor
- Auto locking to tri or bi-level reference
- Looped reference output

Optional Features

- V6302/AH Audio Processor

Specification

Serial Digital Inputs	2 – (Selectable)
Standards	SMPTE 259M (SD), SMPTE 292M (HD)
Formats	SMPTE 274M, SMPTE 296M, SMPTE259M, ITU-R BT.656
Line/Field Rates	1080i/50Hz 1080i/59.94Hz 1080i/60Hz 720p/50Hz 720p/59.94Hz 720p/60Hz 576i/50Hz 480i/59.94Hz
Detection	Automatic
Connectors	BNC
Impedance	75 Ohms
Return Loss	>15dB, 5MHz – 1.5GHz
Cable Equalisation	Automatic 0 – 75m @ 1.485Gb/s (Belden 1694)
Serial Digital Outputs	3 – (1 Looped from Input, 2 processed)
Standards	As Input(s)
Formats	As Input(s)
Line/Field Rates	As Input(s)
Connectors	BNC
Impedance	75 Ohms
Return Loss	>15dB, 5MHz – 1.5GHz
Cable Drive	100m @ 1.485Gb/s (Belden 1694)
Reference Input	1 + Loop
Type	Analogue SD Bi-Level or HD Tri Level (Automatic)
Level	1 Vp/p
Connectors	BNC
Impedance	Hi Z, requires 75 Ohm termination
Return Loss	>35dB to 5.5MHz
AES Audio I/O	Optional Module
External	V6302
External + Embedded	V6302/AH (See V6302 Datasheet)
Video Processing	
Frame Synchroniser	Adjustable +/- 255 lines relative to reference input [resolution - single pixel]
Horizontal re-blanking	Zero to half picture width individually for left & right [resolution - single pixel]
Vertical re-blanking	Zero to half picture height individually for upper & lower [resolution - single line]
Active picture area	Adjustable in pixels/lines to output format maximum
Picture Position	Adjustable in pixels/lines [range - +/- 25% picture width/height]
Aspect Ratios	See main text
Colorimetry	Automatic Colour Space Conversion
Ordering Information	
V6481+V6482	Cifer Motion Compensated Standards Converter <i>[modules cannot be purchased separately]</i>
V16HR3G	Rear Module – Occupies 5 slots in a V1606 frame <i>[supplied with Cifer modules]</i>
V6302	Option – Advanced AES Audio Processor
V6302/AH	Option – Advanced AES & Embedded Audio Processor

Specifications subject to change



UK +44 (0) 1189 866 123

USA +1 631 549 5159

WWW.PRO-BEL.COM

France +33 (0) 1 45 18 39 80

Hong Kong +852 2891 9123

03/2008